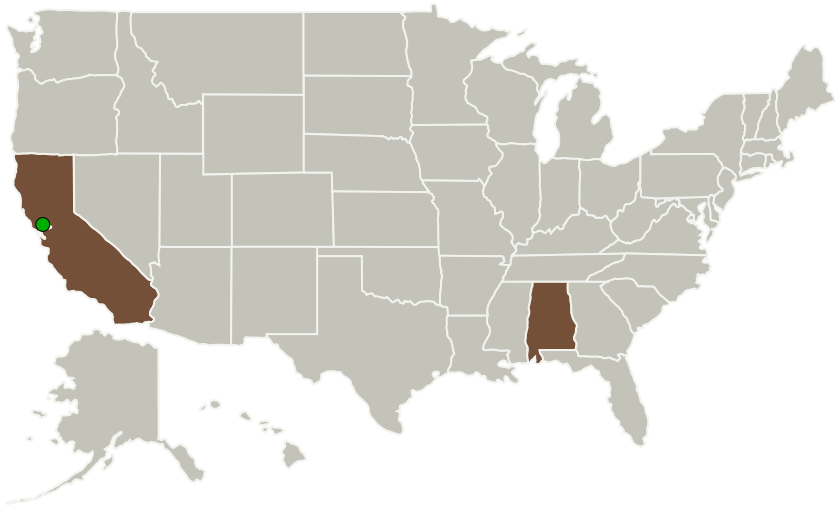
Integrated Inflatable Ballute for Planetary Entry, Phase II

Completed Technology Project (2011 - 2014)

Project Introduction

CFDRC and TRLA are proposing to develop, design and test a highly scalable, mass-optimized inflatable structure that makes maximum utilization of materials in providing tailored stiffness and rigidity for hypersonic entry vehicles. The proposed inflatable structure is a hybrid pressure restraint vessel employing an impervious cloth-reinforced barrier structure enveloped by an integrated array of high-tenacity tendons. The external grid of cordage tendons provides mass- and load pathway-optimized containment of the structure's global pressure loads. In Phase I, the conceptual model was designed and the materials were evaluated for their stiffness. The feasibility of the model was demonstrated for typical Mars trajectory point. Phase II efforts will focus on fabricating and testing a prototype of the proposed inflatable structure to validate the design robustness and capability for larger payload masses. Pre and post testing multidisciplinary integrated fluid-structure-thermal simulations will be conducted to provide insight into the aerodynamic, material stress and dynamic characteristics of the model and to verify/optimize the developed design. Wind tunnel testing as well as dynamic aerostructural simulations will be conducted to verify the stability of the model. The developed inflatable concept will be fabricated complete with flexible TPS, multiple protection layers and sensors and will be tested to demonstrate the prototype folding, packaging, and deployment.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
CFD Research Corporation	Lead Organization	Industry	Huntsville, Alabama
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
Alabama	California

Project Transitions

June 2011: Project Start

May 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140125)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

CFD Research Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Essam Sheta

Co-Investigator:

Essam Sheta

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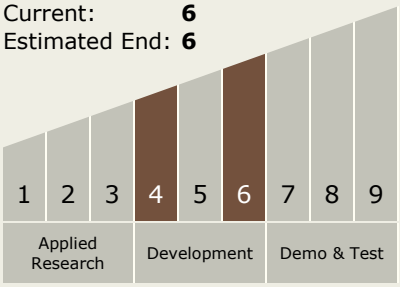
Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.1 Aeroassist and Atmospheric Entry
    - TX09.1.2 Hypersonic Decelerators

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System